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Predictive factors from videourodynamic study for delayed urinary continence after laparoscopic radical prostatectomy

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ABSTRACT

Purpose: To search for risk factors for delayed urinary continence after laparoscopic radical prostatectomy (LRP).**Materials and methods:** Patients who received LRP for localized prostate cancer between January 2011 and December 2013 were enrolled. All patients were evaluated with a detailed history, physical examination, and videourodynamic study (VUDS) prior to the operation. After surgery, they were followed up in the outpatient department at 1 month, 3 months, 6 months, and 12 months. The clinical patient data and VUDS parameters were compared between subgroups of patients with and without stress urinary incontinence (SUI), urgency, or urgency urinary incontinence (UUI) according to their clinical symptoms 6 months after surgery.**Results:** A total of 48 patients with a mean age of 72.1 ± 5.68 years were enrolled. Patients with SUI had a larger mean baseline total prostate volume (TPV) (61.42 ± 30.4 mL vs. 45.64 ± 19.98 mL, $p = 0.04$), higher cancer stage (47.6% vs. 18.5%, $p = 0.031$), and longer operation time (269.95 ± 52.17 minutes vs. 230.15 ± 48.77 minutes, $p = 0.011$) than those without SUI. Most baseline VUDS parameters were not significantly different between SUI and non-SUI subgroups except for full sensation (FS; $p = 0.037$) and the presence of bladder outlet obstruction (BOO; 52.4% vs. 22.2%, $p = 0.038$). Patients with urgency had a higher maximal flow rate ($p = 0.046$) than those without. Patients with postoperative UUI had a larger first sensation of filling (FSF; $p = 0.035$) than those without. Interestingly, baseline urodynamic detrusor overactivity (DO) and BOO did not have an impact on postoperative urgency or UUI. Multivariate analysis showed no parameters which predicted SUI, urgency, or UUI after radical prostatectomy.**Conclusion:** Preoperative small bladder capacity at FS, large prostate, and BOO are predicting factors of SUI at 6 months after LRP. Baseline DO and BOO did not have an impact on postoperative urgency or UUI. Copyright © 2015, Taiwan Urological Association. Published by Elsevier Taiwan LLC.Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Radical prostatectomy is a choice of treatment for patients with localized prostate cancer.^{1,2} The number of patients who received radical prostatectomy has increased rapidly in recent decades. Although the surgical technique has improved, urinary incontinence is still an unavoidable complication. Approximately 10–14% of patients complain of incontinence 2–5 years after radical prostatectomy.³ Urinary incontinence is at its worst by 2 months after

surgery and then improves in most patients. Factors associated with worse incontinence are older age, black race, and a high prostatic specific antigen (PSA) score at diagnosis. Post-prostatectomy urinary incontinence (PPI) may have a strong impact on the life quality of patients.^{4,5}

Generally, the majority of patients with PPI eventually regain continence with an acceptable health-related quality of life.⁶ However, if PPI persists for a long time, it could have many bothersome effects and patients often feel despondent, depressed, or even suicidal.^{7–9} Thus, identifying risk factors for PPI is important.¹⁰ Several preoperative predictors have been discussed in previous studies including age, body weight, prostate volume, preoperative incontinence, and history of a previous transurethral resection of the prostate, but results are still controversial.^{11–16} Some surgical

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techniques are performed to improve postoperative continence. The nerve sparing technique seems to be associated with a short time to recovery of urinary continence, whereas bladder neck preservation is not considered beneficial.¹⁷

Videourodynamic study (VUDS) is a useful tool to evaluate the storage and voiding status of patients with lower urinary tract dysfunction. Although several preoperative predictors for PPI have been assessed, there is still a lack of data on urodynamic changes in patients after radical prostatectomy. Moreover, the association between preoperative VUDS parameters and postoperative continence remains unknown. This study aimed to investigate the relationship between preoperative VUDS parameters and delayed urinary continence after radical prostatectomy, and the potential role of several clinical variables as risk factors for persistent incontinence after the operation.

2. Materials and methods

This prospective study included the patient and VUDS data from 48 patients who received a laparoscopic radical prostatectomy (LRP) for localized prostate cancer (Table 1) between January 2011 and December 2013. The surgeries were performed in a standard extraperitoneal procedure by two urologists (V.C.K. and Y.C.T.) who had experience in LRP. All patients were evaluated with a detailed history, physical examination, transrectal sonography of the prostate, PSA, and VUDS prior to the operation. After LRP, pelvic floor muscle training was routinely instructed and the exercise was advised to continue until urinary control was achieved. The patients were followed up in the outpatient department at 1 month, 3 months, 6 months, and 12 months after surgery.

VUDS was performed prior to radical prostatectomy. The patient was positioned in the supine position. A 6 Fr dual-channel urethral catheter was inserted transurethrally to record intravesical pressure and infuse warm normal saline containing 20% urographin. An 8 Fr rectal balloon catheter was used to record the intra-abdominal pressure. The VUDS was performed at a filling rate of 30 mL/min

Table 1
Baseline characteristics of 48 men who underwent laparoscopic radical prostatectomy.

Variable	Mean $\pm$ SD or n (%)
Age (y)	72.1 $\pm$ 5.68
Prostate volume (mL)	52.6 $\pm$ 26.6
Initial PSA (ng/mL)	33.3 $\pm$ 5.93
Urge incontinence	3 (6.3)
Urgency	16 (33.3)
Preoperative VUDS	
First sensation of filling (mL)	116.8 $\pm$ 52.2
First sensation (mL)	187.4 $\pm$ 80.7
Bladder compliance (mL/cmH ₂ O)	65.3 $\pm$ 75.0
Pdet.Qmax (cmH ₂ O)	44.7 $\pm$ 20.4
Qmax (mL/sec)	14.9 $\pm$ 14.5
Voided volume (mL)	264.7 $\pm$ 116.2
Postvoid residual (mL)	31.3 $\pm$ 63.8
Bladder capacity (mL)	296.0 $\pm$ 105.8
Bladder outlet obstruction	21 (43.8)
BOO index (Pdet at Qmax – 2Qmax)	14.9 $\pm$ 36.1
Detrusor overactivity	31 (64.6)
Operation-related factors	
Nerve sparing procedure	18 (37.5)
Blood loss (mL)	490.3 $\pm$ 372.2
Operation time (minutes)	247.6 $\pm$ 54.0
Positive surgical margin	9 (18.8)
Pathology	
Advanced tumor stage ($\geq$ T3a or N+)	15 (31.3)
Gleason score ($\geq$ 7)	26 (54.2)

BOO = bladder outlet obstruction; PSA = prostatic specific antigen; Pdet.Qmax = detrusor pressure at Qmax; Qmax = maximum flow rate; VUDS = videourodynamic study.

with men in a standing position. The voiding pressure was defined as the detrusor pressure (Pdet) at the maximum flow rate (Qmax). Detrusor overactivity (DO) was defined as evidence of spontaneous detrusor contractions during bladder filling (phasic DO) or prior to uninhibited detrusor contraction voiding at bladder capacity (terminal DO) during the urodynamic study.¹⁸ If patients had a strong desire to void at a capacity of < 350 mL and did not have DO, they were considered to have a hypersensitive bladder.

Urodynamic parameters were measured and recorded in detail, including first sensation of filling (FSF), full sensation (FS), bladder compliance, Qmax, postvoid residual (PVR), voided volume, voiding Pdet at Qmax (Pdet.Qmax), presence of DO, bladder outlet obstruction index (BOOI) [defined as Pdet.Qmax – (2 $\times$ Qmax)], and presence of BOO.

The VUDS was repeated at least twice to obtain a reproducible pressure flow tracing. The definition of BOO was based on the provisional International Continence Society definition of obstruction.¹⁸ BOO was defined when the pressure-flow study showed a Pdet.Qmax > 50 cmH₂O or a BOOI > 40. In patients with equivocal pressure flow results, the features of the bladder neck, prostatic urethra, and external sphincter on voiding cystourethrography were used for the diagnosis of BOO, bladder neck dysfunction, or poor relaxation of urethral sphincter.^{19–21}

Clinical patient data included the age at prostatectomy, presence of urgency or urgency urinary incontinence (UII), total prostate volume (TPV), initial PSA level, operation time, nerve-sparing status, blood loss, cancer stage ($\leq$ T2c and $\geq$ T3a), Gleason grade ($\leq$ 6 and $\geq$ 7), and positive surgical margin.

At 6 months after LRP, all patients were questioned about their bladder and voiding condition. Stress urinary incontinence (SUI) and UII were diagnosed by patients' subjective reports of urinary incontinence on abdominal straining or coughing (SUI), or at the episode of urgency sensation (UII). The presence of SUI and UII was further confirmed during VUDS. Patient data and VUDS parameters were compared between subgroups of patients with and without SUI, with and without urgency, and with and without UII according to their clinical symptoms.

Continuous variables are expressed as medians with standard deviations (SD). The Wilcoxon rank sum test was used for statistical comparisons of continuous variables between subgroups. Univariable and multivariable logistic regression analyses were performed to determine whether the factors were predictive of delayed urinary continence after LRP. All statistical assessments were two-sided and considered significant at $p < 0.05$. Statistical analyses were performed using SPSS version 15.0 statistical software (SPSS Inc., Chicago, IL, USA).

3. Results

The mean age of patients who received radical prostatectomy was 72.1 $\pm$ 5.68 years. The initial serum PSA level was 33.3 $\pm$ 5.93 ng/mL with a TPV of 52.6 $\pm$ 26.6 mL. Three (6.25%) patients had UII, while 16 (33.3%) patients had urgency symptoms prior to radical prostatectomy. Preoperative VUDS revealed urodynamic abnormalities in 34 (70.8%) patients, including DO in 31 (64.6%) and BOO in 21 (43.8%) (Table 1).

At 6 months after radical prostatectomy, 21 (43.8%) patients had SUI, 28 (58.3%) had urgency symptoms, and nine (18.8%) patients had UII. All patients voided smoothly after surgery. No DU was noted in the baseline VUDS.

Patients with SUI after radical prostatectomy had a significantly larger mean baseline TPV (61.4 $\pm$ 30.4 mL vs. 45.6 $\pm$ 20.0 mL, $p = 0.04$), higher cancer stage (47.6% vs. 18.5%, $p = 0.031$), and longer operation time (270.0 $\pm$ 52.2 minutes vs. 230.2 $\pm$ 48.8 minutes, $p = 0.011$; Table 2) than those without SUI. Most baseline

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